

## **Lecture**

# **Module 1: Soil Quality**

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### **Learning Objectives**

Upon completion of this module, participants will be able to:

1. Describe five soil functions and how they interrelate on each part of the landscape.
2. Explain how land use and management practices can change soil properties and soil function, and therefore affect land productivity and environmental quality.
3. Provide examples of how soil erosion and other forms of soil degradation can result in permanent loss of soil function.

### **Lecture Outline**

Soil quality and landscape health

Calloway Gardens example of long-term soil management effects

Functions of healthy soil

Soil functions:

Partition and regulate the flow of water

Cycle nutrients

Buffer and filter contaminants

Provide structural support

Support biodiversity and productivity

Interaction of soil processes on different parts of the landscape

How cover crops and other practices protect soil functions

Productivity and biodiversity

How organic matter management affects soil function

Soil management

Erosion control

Tillage systems

Residue management

Vegetation management

Crop rotation

Cover crops

- Benefits
- Types of covers
- Methods of killing cover crops
- Pastureland management
- Rangeland management
- Pest management
- Monoculture
- Deep-rooted crops
- Woodland management
- Wetlands
- Urban and suburban lands
- Irrigation
- Livestock waste utilization
- Buffers

Soil quality assessment and monitoring

## Exercises

### *Classroom exercise – Identifying local soil quality issues*

#### Part A: Inherent soil quality

Acquire a soil survey for your area. From the information provided in the local soil survey, name two distinctly different soil map units that are important in your region. For each soil fill out the tables below. In the first column list several inherent soil characteristics. In the second and third columns explain how each characteristic affects soil function and land management.

Name of first soil map unit: \_\_\_\_\_

Where is the soil located on the landscape? \_\_\_\_\_

Inherent soil characteristics	How does each characteristic affect soil function? (Review the list of soil functions. You may include multiple effects for each soil characteristic.)	Management considerations and rationale
Example: Sandy texture	Water partitioning: Water infiltration is rapid and AWC is low	Irrigate frequently, with low amounts of water.

Name of second soil map unit: \_\_\_\_\_

Where is the soil located on the landscape? \_\_\_\_\_

Inherent soil characteristics	How does each characteristic affect soil function?	Management considerations and rationale

Part B: Dynamic soil quality

For one of the soils used in Part A, fill out the table below. In the first column, list two or more land management systems used in your region. In the second and third columns explain how that system affects soil characteristics and soil function.

Name of soil map unit: \_\_\_\_\_

Management system	Effect on soil characteristics (You may list multiple effects.)	Effect on soil function (Include positive and negative, and short-term and long-term effects.)
<i>Example: No-till, combined with increased biomass inputs such as a cover crop.</i>	<i>Increased Soil Organic Matter and AWC over time.</i>	<i>Water partitioning: Plants will be less susceptible to drought.</i>

### ***Field exercise – Assessing soil quality***

Use the Soil Quality Test Kit (<http://www.statlab.iastate.edu/survey/SQI/kit2.html>) or another assessment tool to compare the soil quality at two locations with the same kind of soil but that have been under different land use or management for several years. Choose indicators appropriate to your soil and land use, or at a minimum, do “Soil Physical Observations” (Section 11) and “Infiltration Test” (Section 3) as described in the Test Kit Guide. Explain the differences between the two soils.

For further help in planning an assessment, see the Guidelines for Soil Quality Assessment in Conservation Planning (<http://www.statlab.iastate.edu/survey/SQI/Assess.htm>).

## **Study Questions**

1. List and describe the five soil functions.
2. Explain how the type and amount of organic matter in the soil affect each of the functions.
3. What is the difference between soil assessment and monitoring?

4. Describe how soil quality relates to conservation programs and the NRCS mission.
5. What soil management practices used decades or centuries ago are apparent on the land in your area today? What practices today will be apparent in 50 or 100 years from now?
6. What prevents land managers in your area from adopting practices that enhance soil quality and soil function?

## References and Selected Reading

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### Web based reference:

NRCS Soil Quality Institute <http://soils.usda.gov/sqi/> -- Includes references to other articles and web sites, information about assessment tools and management practices, and general soil quality information.